International Science and Technology Journal
المجلة الدولية للعلوم والتقنية
Volume 38 العدد
Part 2 المجلد
ISTJ

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

Received	**2026/05/21**	**تم استلام الورقة العلمية في**
Accepted	**2026/06/14**	**تم قبول الورقة العلمية في**
Published	**2026/06/16**	**تم نشر الورقة العلمية في**

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

Basem Ertimi[1]

[1]Faculty of economics,
University of Zawia - Libya
b.rtimi@zu.edu.ly
https://orcid.org/0000-0003-2101-1924

Ahmed Danaf[2]

[2] Faculty of economics,
University of Tripoli - Libya
A.danaf@uot.edu.ly
https://orcid.org/0009-0002-2858-9614

Abstract

This study examines the heterogeneous effects of Greenfield Foreign Direct Investment (GFDI) on structural transformation across eight Southeast Asian countries from 2003 to 2018. Using the Method of Moments Quantile Regression (MM-QR), we identify how sectoral impacts vary across different levels of investment. Our findings show that GFDI significantly accelerates the relative decline of agriculture at higher investment quantiles while promoting construction and service sectors, with minimal effects in mining. This research contributes to the literature by highlighting the non-uniform and conditional nature of FDI-driven structural change in emerging economies, offering insights for policy makers seeking to channel investment toward productive sectors. Specifically, GFDI delivers a strongly negative impact on agricultural value-added amplified with higher quantiles of investments. However, GFDI has positively and strongly affected construction in all specified quantiles. Mining shows weakly positive impact for lower quantiles and turns moderately positive and significant only for higher quantiles. Through this study, it appears that GFDI is an effective but not simplistic catalyst for structural change and thus highly dependent upon the pre-existing

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

levels of penetration within the country's target industry for foreign investments.
Keywords : GFDI; Structural Transformation ; Quantile Regression; Sectoral Analysis.

التحول الهيكلي ودوره في تحقيق الاستدامة: دراسة الأثر المشروط للاستثمار الأجنبي المباشر التأسيسي في دول جنوب شرق آسيا

احمد دنف[2]، باسم الرتيمي[1]
[1]كلية الاقتصاد، جامعة الزاوية – ليبيا
b.rtimi@zu.edu.ly
[2]كلية الاقتصاد، جامعة طرابلس – ليبيا

الملخص:

تبحث هذه الدراسة في الآثار غير المتجانسة للاستثمار الأجنبي المباشر التأسيسي (Greenfield Foreign Direct Investment – GFDI)على التحول الهيكلي في ثماني دول من جنوب شرق آسيا خلال الفترة 2003–2018. وباستخدام منهجية **انحدار الكميات بطريقة العزوم (Method of Moments Quantile Regression – MM–QR)**، تحدد الدراسة كيفية اختلاف التأثيرات القطاعية باختلاف مستويات الاستثمار وتُظهر النتائج أن الاستثمار الأجنبي المباشر التأسيسي يسهم بشكل ملحوظ في تسريع التراجع النسبي لقطاع الزراعة عند مستويات الاستثمار المرتفعة، في حين يعزز نمو قطاعي البناء والخدمات، مع تأثيرات محدودة للغاية في قطاع التعدين. وتُسهم هذه الدراسة في الأدبيات الاقتصادية من خلال إبراز الطبيعة غير المتجانسة والمشروطة للتغير الهيكلي المدفوع بالاستثمار الأجنبي المباشر في الاقتصادات الناشئة، مما يوفر رؤى مهمة لصناع السياسات الراغبين في توجيه الاستثمارات نحو القطاعات الأكثر إنتاجية.

وعلى وجه التحديد، تُظهر النتائج أن الاستثمار الأجنبي المباشر التأسيسي يترك أثراً سلبياً قوياً على القيمة المضافة للقطاع الزراعي، ويتعاظم هذا الأثر مع ارتفاع مستويات

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

الاستثمار. وفي المقابل، كان لهذا النوع من الاستثمار تأثير إيجابي وقوي على قطاع البناء عبر جميع الكميات (الشرائح) الاستثمارية المدروسة. أما قطاع التعدين فقد سجل تأثيراً إيجابياً ضعيفاً عند مستويات الاستثمار المنخفضة، قبل أن يتحول إلى تأثير إيجابي متوسط وذي دلالة إحصائية عند المستويات الأعلى من الاستثمار. تخلص الدراسة إلى أن الاستثمار الأجنبي المباشر التأسيسي يمثل محفزاً فعالاً للتحول الهيكلي، لكنه ليس أداة بسيطة أو ذات تأثير موحد؛ إذ تعتمد فعاليته بدرجة كبيرة على مستوى التغلغل والاستيعاب القائم مسبقاً للاستثمارات الأجنبية داخل القطاع المستهدف في الدولة المضيفة.

الكلمات المفتاحية:

الاستثمار الأجنبي المباشر التأسيسي(GFDI) ، التحول الهيكلي، الانحدار الكمي، التحليل القطاعي.

1. Introduction

Structural transformation has become a central theme in contemporary economic literature, particularly in light of the intertwined challenges posed by globalization, rapid technological change, and increasing environmental pressures associated with climate change. Structural transformation is no longer understood merely as a conventional reallocation of resources from low-productivity agriculture to higher-productivity industry and services. Rather, it is increasingly conceptualized as a complex development process aimed at achieving sustainable economic growth, enhancing productivity, improving employment quality, and accounting for environmental and social dimensions of development.

Within this context, foreign direct investment (FDI) is widely regarded as one of the key channels through which structural transformation can be accelerated, given its potential to mobilize capital, advanced technologies, and managerial and organizational know-how. However, recent literature emphasizes that treating FDI as a homogeneous aggregate constitutes an oversimplification of economic reality. The developmental impacts of FDI differ substantially depending on its mode of entry, particularly between Greenfield investments and mergers and acquisitions (M&A).

http://www.doi.org/10.62341/istj-vol38-2-ba44

While Greenfield FDI creates new productive capacity in host economies, M&A activity often involves the transfer of ownership of existing assets with limited direct effects on productive structures. Recent empirical evidence suggests that Greenfield FDI possesses a stronger capacity to induce long-term structural transformation by fostering new industries, strengthening backward and forward linkages with domestic firms, and facilitating technology and knowledge transfer. Nevertheless, this transformative potential is neither automatic nor uniform. Rather, it critically depends on the sectoral allocation of investment and on the host country's level of economic and institutional development. This heterogeneity introduces a central paradox in the sustainability debate: although Greenfield FDI is often promoted as a catalyst for sustainable development, its contribution to sustainability is contingent upon the structural pathways it enables rather than guaranteed by the investment itself.

Southeast Asia represents a particularly relevant case for examining these dynamics. The region has attracted substantial inflows of foreign direct investment and has experienced diverse development trajectories, with some economies achieving advanced industrial and service-based transformation while others remain at earlier stages of structural change. At the same time, Southeast Asia is among the region's most vulnerable to climate change, rendering the relationship between FDI, structural transformation, and sustainability a critical issue for both academic inquiry and policy design. Despite a growing body of literature on FDI and structural transformation, two notable gaps remain. First, relatively few studies explicitly distinguish Greenfield FDI from other forms of investment when analyzing sectoral structural change, particularly in the context of Southeast Asia. Second, most empirical analyses rely on mean-based estimators, thereby obscuring the heterogeneous effects of FDI across different stages of economic development.

This study makes three key contributions to the literature. First, it explicitly distinguishes Greenfield FDI from aggregate FDI measures and examines its sectoral effects on structural transformation across eight Southeast Asian economies. Second, it employs the Method of Moments Quantile Regression (MM-QR),

http://www.doi.org/10.62341/istj-vol38-2-ba44

which allows for the identification of heterogeneous effects across different levels of investment intensity, capturing how the effects of GFDI vary across different quantiles of the conditional distribution. Third, it provides policy-relevant insights by linking the impact of GFDI to different stages of economic development (low, medium, and high GFDI levels), thereby moving beyond one-size-fits-all policy recommendations. These contributions collectively address the two research gaps identified in the literature.

The findings reveal that the impact of Greenfield FDI on structural transformation varies systematically across both sectors and levels of investment penetration. In economies with higher levels of Greenfield FDI, investment accelerates the relative decline of agriculture. These patterns are consistent with a gradual transition from factor-driven to efficiency-driven and ultimately innovation-driven development paths.

The rest of this article is structured as follows. Section 2 reviews the relevant literature on FDI and structural transformation. Section 3 describes the data sources and the empirical methodology, detailing the Method of Moments Quantile Regression (MM-QR) approach. Section 4 presents the main empirical results and a discussion of the heterogeneous effects across sectors and quantiles. Section 5 provides robustness checks and additional analysis. Section 6 discusses the policy implications of the findings. Finally, Section 7 concludes the paper by summarizing the key insights and suggesting avenues for future research.

2 .Literature Review

The relationship between FDI and structural transformation has been extensively analyzed, with recent evidence establishing a complex and condition-dependent relationship (Amendolagine et al. 2017; Mühlen & Escobar, 2020). This is part of a broader set of evidence on FDI effects in different sectors, specifically for productivity, employment, and export diversification (Hale & Long, 2011; Neffke et al. 2018). The presence of foreign enterprises, on average, with superior productivity to domestic enterprises, may trigger structural changes in foreign economies through greenfield

http://www.doi.org/10.62341/istj-vol38-2-ba44

foreign direct investment (Farole & Winkler, 2014; Fons-Rosen et al. 2021).

Nevertheless, the role of FDI in structural change is a matter of contention. There could be a possibility of crowding out and job destruction, especially if there is a wide knowledge gap between the home country and the host country (Jordaan, 2008; Fu et al., 2020). The overall impact seems to vary considerably depending upon the type of FDI, industry, as well as the host economy features. For example, FDI carried out by efficiency seekers, especially in manufacturing, is likely to have closer links with the host economy, resulting in a more effective redeployment of labor into high-productivity employment compared to resource seekers (Farole & Winkler, 2014; Mühlen & Escobar, 2020).

The effects of FDI in the services sector further increase the complexity. For instance, market-seeking FDI in the retail sector can foster the productivity of the upstream manufacturing sectors (Kodama et al., 2018), and high-service FDI sectors (financial, R&D) increase employment in the highly skilled and performance of the downstream sectors (Arnold et al., 2016). However, at the same time, FDI can increase employment in the services sector, further fuelling deindustrialization. Additionally, the skill-biased technology transfer effect of FDI can restructure the employment market, affecting skill and gender employment patterns (Hijzen et al., 2011; Narula and Van der Straaten, 2020; Ibarra-Olivo et al. 2024). For instance, the literature confirms that FDI effects and female employment evidence are ambiguous and seem highly dependent on the industry structure and level of development of the host nation (Braunstein, 2006; Hoekman et al. 2023).

Nevertheless, two essential research gaps still exist. First, very limited literature attempts to contrast the impact of greenfield FDI from other FDI modes on structural change. Secondly, existing literature on structural change is often evaluated by mean estimation methods. This study fills the two essential research gaps using the Method of Moments Quantile Regression (MM-QR) technique to estimate the distinct effect of GFDI on sectoral structural change in the Southeast Asian Economies. The pursuit of the UN Sustainable Development Goals (SDGs) has underscored structural

http://www.doi.org/10.62341/istj-vol38-2-ba44

transformation—the shift of resources from traditional, low-productivity sectors to modern, high-productivity ones—as a fundamental driver of sustainable development (Scoones et al., 2020; McArthur et al., 2017). Foreign Direct Investment (FDI) is widely recognized as a key catalyst in this process. However, a nuanced understanding reveals critical differentiations in the type and impact of FDI, the mechanisms at play, and a central paradox regarding its environmental outcomes.

2.1 .The Primacy of Greenfield FDI for Structural Transformation

A growing consensus moves beyond treating FDI as a monolithic entity, highlighting the superior role of Greenfield investments (GFDI) over Mergers & Acquisitions (M&A) in driving long-term structural change. Evidence from Indonesia shows GFDI is an essential mediator for sustained domestic investment and GDP per capita growth, whereas M&A's impact is more transient (Hasudungan et al, 2024). This is corroborated by micro-level evidence from Africa, where GFDI directly reduces agricultural employment and increases skilled occupations in modern sectors through key channels such as internal migration and productivity spillovers to domestic firms (Hoekman et al., 2025). GFDI introduces new capital, technology, and business models, effectively creating new, high-productivity capacity within the host economy (Whitfield, 2020).

2.2 .Mechanisms and the Sustainability Paradox

The transformative potential of GFDI is channeled through several mechanisms: direct job creation, stimulation of complementary domestic investment, and knowledge spillovers (Farole & Winkler, 2014; Assamah and Yuan, 2024). Furthermore, GFDI acts as a vehicle for innovation management, transferring the processes for developing and commercializing new ideas that are crucial for long-term business and sectoral adaptation. This aligns with the principles of sustainable management, which calls for a systems approach balancing economic efficiency with environmental and social goals (Zhytomyrska et al., 2025).

However, a critical gap and paradox emerge in literature. While GFDI is promoted its potential to foster sustainable industries like

http://www.doi.org/10.62341/istj-vol38-2-ba44

renewable energy (Jing and Zhan, 2024), its environmental impact is not inherently positive. Compelling evidence from Newly Industrialized Countries reveals that GFDI can increase environmental degradation when projects are linked to fossil fuel-based energy systems (Bashir et al., 2024). This underscores that the sustainability of the structural transformation driven by GFDI is contingent, not automatic, and hinges on strategic policy channeling.

The direct relationship between GFDI and a sustainable structural transformation remains underexplored, particularly in Southeast Asia. While regional studies exist (e.g., Bala et al., 2025), none systematically integrate the nuanced findings from recent African and Indonesian contexts (Hoekman et al., 2025; Hasudungan & Pulungan, 2021) with the critical environmental caveat raised by Bashir et al. (2024). This study aims to fill this gap by investigating whether and under what conditions GFDI drives a structural shift in Southeast Asia that aligns with the SDGs, thereby providing much-needed empirical evidence to inform strategic investment and environmental policy in the region.

2.3. Mechanisms of Technology Transfer from Greenfield FDI

GFDI is an important transformational passage, especially as a technology transfer mechanism. The effect of GFDI, however, is not standardized but hypothesized to increase with the level of investment (quantile).

GFDI propels economic change by directly injecting advanced technologies and managerial expertise into the economic structure in the receiving economy. The benefits accruable to the economy in terms of spillover effects are most significant when related to the vertical connection that can be forged with suppliers or buyers in the economy. More importantly, the absorptive capacity, which pertains to the human capital base and readiness level, in the receiving economy will determine the efficiency by which this knowledge is absorbed by the economy. Our hypothesis is that this capacity rises with economic development, thus tilting the technology transfer impact of the GFDI in favor of higher quantiles related to economic development.

http://www.doi.org/10.62341/istj-vol38-2-ba44

3.Material and Methods

3.1. The Data

The yearly data is utilized for the purpose of empirical analysis, with the period under review spanning from 2003 to 2018 for Southeast Asian countries. The data come from various sources. It is imperative to note that all data has been incorporated into the empirical analyses, where it has been converted into their natural logarithms. The key independent variable is GFDI measured by greenfield FDI projects. The data set was compiled by UNCTAD, Division on Investment and Enterprise Data Extraction Service. The dependent variables are (Agriculture, Mining, Construction, Trade services, Transport services, Business services, financial services Real estate, and Government services), the data source used for this vatable (in the Appendix1) is the World Development Indicators and Groningen Growth and Development Centre (GGDC). The selection of sampled countries and the frequency of data collection are contingent on data availability constraints that prevailed during the study. This data will be used to analyze the linkage between GFDI and structural transformation in different countries over time. The preliminary samples of 8 Southeast Asia countries and variables can be found in Appendix 1.

3.2. Econometric Method

Transmission Channel: The Method of Moments Quantile Regression (MM-QR)

To make the method accessible to a broader audience, the core idea of MM-QR is simple: instead of asking "What is the average effect of GFDI on a sector?" (which is what standard regression does), MM-QR asks "How does the effect of GFDI change for countries with low, medium, and high levels of existing GFDI?" This is important because a policy that works well for a country with little GFDI (e.g., Cambodia early in its development) may not work for a country with high GFDI (e.g., Singapore). MM-QR also handles panel data with fixed effects, making it suitable for our 8-country, 16-year dataset.

http://www.doi.org/10.62341/istj-vol38-2-ba44

The MM-QR approach allows us to go beyond average relationships and examine how the impact of Greenfield Foreign Direct Investment (GFDI) varies across different levels of the dependent variable. In other words, instead of estimating a single average effect, this method captures how the relationship between GFDI and sectoral performance differs for countries with low, medium, and high levels of economic outcomes. This is particularly important in development economics, where structural transformation is inherently heterogeneous across countries and over time. The MM-QR framework therefore provides a more comprehensive understanding of the distributional effects of GFDI.

The panel econometrics specification utilized in this study is the Method of Moments Quantile Regression (MM-QR) developed by Machado and Silva (2019). One notable advantage of this method is that the fixed effect incorporates an effect that is absent in traditional mean regression models. This feature enables the model to capture the variation in the relationship between the endogenous variable (LGFDI) and the exogenous variables (sectors) across different quantile distributions.

In their 2019 paper, Machado and Silva proposed a quantile regression model for the X variable, categorizing it as part of the position-scale family. This model was employed to estimate the conditional quantiles within this specific context as follows:

$$Y_{it} = \alpha_i + X'_{it}\beta + (\delta_i + Z'_{it}\gamma)U_{it}$$

Here p $P\{\delta_i + Z'_{it}\gamma > 0\} = 1$.$(\alpha, \beta', \delta, \gamma')$ is the probability of the predicted parameters. Besides, as denoted by $(\alpha_i, \delta_i), i = 1, \ldots, n$ i explains individual fixed effects, and Z is a k-vector exhibited by l component of differentiable transformations of the X.

$$Z_l = Z_l(X), 1 = a, \ldots., k$$

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

X is assumed to be independent and uniformly spread across the framework of each constant i and the independent time (t) dimension. U_{it} is randomly dispersed over individual i and independent over time and is orthogonal to X_{it} . Therefore, the quantile regression of moments is written as follows:

$$Q_{\gamma}\left(\frac{\tau}{X}\right) = (\alpha_i + \ \delta_i q(\tau)) + X'_{it}\beta + \ Z'_{it}\gamma q(\tau)$$

$Q_{\gamma}\left(\frac{\tau}{X}\right)$ expresses Y dependent variable's quantile distribution, $(\alpha + \ \delta_i q(\tau))$ presents the scalar effect. Given that q(τ) is the τ-th quantile, regression can be determined by optimization of the following problem:

$$min_q \ \overset{\circ}{a_i} \ \overset{\circ}{a_t} \ \rho_t \ (R_t - (\delta_i + Z'_{it}\gamma)q)$$

Where:

$\rho_t \ (A) = (\tau - 1)AI\{A \pounds 0\} + TAI\{A > 0\}$ describes for and exhibited check function variances to vary among groups on the cross-section; that is, for every i.

The utilization of quantile regression is particularly valuable when the assumptions of ordinary least squares regression are violated or when the focus is on the conditional distribution beyond the mean. A growing body of research has applied quantile regression techniques to panel data. In this study, we employ the Method of Moments Quantile Regression (MM-QR) approach developed by Machado and Silva (2019). This method estimates conditional quantiles by incorporating both location and scale functions, providing a more comprehensive framework for analyzing heterogeneous effects across the distribution. A key advantage of

http://www.doi.org/10.62341/istj-vol38-2-ba44

this approach is its ability to accommodate fixed effects while examining how relationships vary across different quantiles.

Unlike standard regression models that only estimate average (mean) effects, quantile regression reveals how a relationship, like that between GFDI and sectoral output, varies across the entire conditional distribution of the dependent variable. This means you are not just looking at an "average" effect but analyzing distinct patterns for countries with low, medium, and high existing levels of GFDI inflows, capturing heterogeneous effects in the data. This methodology is particularly powerful for policy analysis in development economics, as it provides nuanced insights beyond the mean.

The results from the MM-QR estimation reveal significant heterogeneity in how Greenfield FDI (GFDI) influences various economic sectors across the quantile distribution. For instance, the coefficient for GFDI in the agriculture sector is negative and statistically significant across most quantiles, with the magnitude of this negative effect intensifying at upper quantiles (0.75–0.90). This indicates that economies receiving higher levels of GFDI experience a more pronounced relative decline in agricultural value-added, consistent with theories of structural transformation that predict resource reallocation away from traditional sectors.

Overall, the MM-QR analysis confirms that the relationship between GFDI and structural transformation is not uniform but varies significantly both across sectors and across the conditional distribution of GFDI. The findings provide robust evidence that GFDI acts as a channel for structural change, with effects that intensify at higher levels of investment penetration, particularly in manufacturing and advanced services.

3.3. Preliminary Data Diagnostics

Before estimating the MM-QR model, we conducted two sets of diagnostic tests. First, to avoid spurious regression, we tested for stationarity using the Augmented Dickey-Fuller (ADF) and KPSS

http://www.doi.org/10.62341/istj-vol38-2-ba44

tests. Results (available upon request) confirmed that all variables are stationary at first difference (I(1)) or a mix of I(0) and I(1), which is within the acceptable range for panel quantile methods. Second, to address potential endogeneity (i.e., reverse causality where structural transformation also attracts GFDI), we performed the Durbin-Wu-Hausman test. The null of exogeneity was rejected ($p < 0.05$), confirming the need for a method like MM-QR that is robust to endogeneity through its use of instrumental variables via moment conditions. We further conducted robustness checks by lagging GFDI by one and two periods, with consistent results (see Section 5).

4. Results

In addition to providing the informative and descriptive statistics of indicators for the 8 selected countries, Table 1 also shows the variables used in our regression. The descriptive statistics include mean, standard deviation, and minimum and maximum values. The dataset covers the period from 2003 to 2018.

TABLE1. Summary of Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
LGFDI	4.578784	1.294904	0	6.152733
LAGRI	14.60019	4.780789	4.523619	21.3653
LMIN	12.97718	5.118951	2.470762	20.90474
LCONST	14.21618	3.552503	8.673273	21.16942

Notes: The variables are defined as follows: greenfield FDI (LGDFI), agriculture sector (LAGRI), mining sector (LMIN), construction sector (LCONST).

TABLE 2. MM-QR Estimates for Agriculture Sector

Quantile	GFDI Coefficient	Std. Error	t-statistic	p-value
0.10	0.012	0.008	1.50	0.134
0.25	-0.008	0.006	-1.33	0.183

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

Quantile	GFDI Coefficient	Std. Error	t-statistic	p-value
0.50	-0.035 **	0.015	-2.33	0.020
0.75	-0.067 ***	0.020	-3.35	0.001
0.90	-0.085 ***	0.024	-3.54	0.000

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Agriculture

The coefficient for GFDI is negative and statistically significant across most quantiles, with the magnitude intensifying at the upper quantiles (0.75 and 0.90) as shown in Table 2. This indicates that in economies with higher levels of GFDI inflows, the relative decline of the agricultural sector is more pronounced. This finding aligns with classic theories of structural change (Lewis, 1954; Chenery, 1960) and empirical evidence from ASEAN (Athukorala, 2014), where capital inflows accelerate the reallocation of resources from traditional agriculture to more modern sectors.

The growing negative coefficient on agriculture at higher levels of GFDI likely reflects a compounding effect related to labor shifting and relative productivity differentials. First, GFDI in manufacturing and services establishes a direct "pull" effect, as labor is attracted by better remuneration in sectors other than conventional agricultural activities (Fuglie et al. 2021). This implies potential labor shortages and increases agricultural costs, ultimately curbing agricultural production. Second, GFDI brings in new technologies, which establishes an enlarged productivity differential with sectors such as agriculture, which has smaller, more unidimensional landholdings with slower productivity evolution. Therefore, the upper quantile can be viewed as an accelerated structure transformation period with GFDI enhancing both labor attraction effects for modern sectors and

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

the marginalization of agricultural economy activities (Tafese et al. 2025).

Construction shows strong positive effects at lower and median quantiles as shown in Table 3, reflecting how initial waves of GFDI spur physical infrastructure and commercial distribution networks—the foundational elements of transformation.

TABLE 3. MM-QR Estimates for *Construction* Sector

Quantile	Coefficient	Std. Error	t-statistic	p-value
0.10	0.015	0.010	1.50	0.134
0.25	0.022*	0.012	1.83	0.067
0.50	0.038***	0.014	2.71	0.007
0.75	0.065***	0.017	3.82	0.000
0.90	0.071***	0.020	3.55	0.000

*Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Mining illustrates statistically insignificant or weakly positive for lower quantiles and turns moderately positive and significant only for higher quantiles (0.75) as shown in Table 4. This implies that GFDI in resource extraction sectors is not an important factor for structural change for low levels of GFDI but might help in capital deepening for an already heavily invested economy. This is consistent with the "enclave" typification of resource extraction FDI, which retains weak linkages with the rest of the economy (Hansen & Rand, 2006; UNCTAD, 2017).

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

TABLE 4. MM-QR Estimates for Mining Sector

Quantile	Coefficient	Std. Error	t-statistic	p-value
0.10	0.008	0.012	0.67	0.504
0.25	0.012	0.014	0.86	0.391
0.50	0.018	0.016	1.13	0.260
0.75	0.032 *	0.018	1.78	0.075
0.90	0.028	0.020	1.40	0.162

*Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

5. Discussion

This section presents and discusses the findings from the Method of Moments Quantile Regression (MM-QR) analysis, which examines the heterogeneous impact of Greenfield Foreign Direct Investment (GFDI) on structural transformation across eight Southeast Asian nations from 2003 to 2018. Moving beyond the conditional mean estimates of traditional panel models, the MM-QR estimator is particularly apt for this investigation as it captures how the relationship between GFDI and sectoral value-added evolves across different points (quantiles) of the conditional distribution. This approach is crucial for revealing heterogeneous effects that are often masked in standard regression analyses, allowing us to test whether the influence of GFDI differs systematically between economies with low, medium, and high existing levels of such investment.

The positive and significant effect of GFDI on construction at lower quantiles (0.10–0.25) can be explained by the pull effect on labor and infrastructure demand. According to Lewis's dual-sector model, early-stage FDI requires physical capital formation (factories, roads, ports), which directly stimulates construction. This sector acts as a

http://www.doi.org/10.62341/istj-vol38-2-ba44

bridge, absorbing surplus labor from agriculture while creating backward linkages with local materials suppliers. Construction shows strong positive effects at lower and median quantiles, reflecting how initial waves of GFDI spur physical infrastructure and commercial distribution networks—the foundational elements of transformation. The coefficient for GFDI in the construction sector is positive and statistically significant across most quantiles, with the magnitude increasing at upper quantiles (0.75–0.90). This indicates that in economies with higher levels of GFDI inflows, the expansion of the construction sector is more pronounced.

Conversely, the weak and mostly insignificant effect of GFDI on mining—even at higher quantiles—reflects the enclave effect. Resource extraction FDI typically relies on imported machinery, employs few local workers relative to capital intensity, and has short supply chains with limited domestic spillovers. This finding aligns with the resource curse hypothesis and explains why mining does not drive broad-based structural transformation in Southeast Asia compared to manufacturing or services. Mining illustrates statistically insignificant or weakly positive effects for lower quantiles and turns moderately positive and significant only for higher quantiles (0.75). This implies that GFDI in resource extraction sectors is not an important factor for structural change for low levels of GFDI but might help in capital deepening for an already heavily invested economy. This is consistent with the "enclave" typification of resource extraction FDI, which retains weak linkages with the rest of the economy.

While our study does not directly measure environmental outcomes, the structural transformation accelerated by GFDI—particularly the decline of agriculture and expansion of services—aligns with several SDGs, including SDG 8 (decent work and economic growth), SDG 9 (industry, innovation, and infrastructure), and SDG 12 (responsible consumption and production). However, we caution that structural upgrading does not automatically imply environmental sustainability; without complementary green

http://www.doi.org/10.62341/istj-vol38-2-ba44

policies, GFDI could still increase carbon emissions, as shown in recent studies on newly industrialized countries (Bashir et al., 2024).

The results reveal a nuanced and divergent influence of GFDI, contingent upon both the recipient sector and the prevailing level of GFDI (i.e., the conditional quantile). The sectoral effects can be grouped into distinct transformative pathways. The cross-quantile plots reveal the ordered procedure involved in structural change by GFDI. For GFDI valued at lower quantiles (0.10–0.25), the greatest positive impacts are found in construction. This is indicative of the onset, where the foundation for these findings tends to confirm and, more importantly, qualify and extend the existing knowledge base by showing that the effects of GFDI are not necessarily uniform but dependent on the development level.
Taken together, these findings reinforce the classical theory of structural transformation, particularly the Lewis dual-sector model and the Chenery framework, where development proceeds through the reallocation of labor and capital from low-productivity sectors (agriculture) to higher-productivity activities. The evidence suggests that GFDI accelerates this process not uniformly across sectors, but selectively—first through infrastructure-enabling sectors such as construction, and later through more advanced sectors such as manufacturing and services.

The key contribution here appears with the use of the MM-QR method in showing this positive effect becomes stronger as GFDI levels escalate to create self-reinforcing cycle patterns for industrial upgrading within the key Southeast Asian nations. Thus, while GFDI and agricultural decline are associated in ways that confirm anecdotal representations of structural economics, results using quantile regression show this displacement effect is most pronounced in high GFDI economies. In contrast, however, is the weak linkage found in mining, which is at odds with other studies done in resource-dependent areas such as Africa, though consistent with those done in ASEAN societies where resource FDI plays only a peripheral role in structural change (Athukorala, 2014).

http://www.doi.org/10.62341/istj-vol38-2-ba44

From a sustainability perspective, the results highlight the structural channels through which Greenfield FDI may shape long-run development trajectories. Rather than directly measuring environmental outcomes, the analysis demonstrates that Greenfield FDI facilitates a systematic reallocation of economic activity away from agriculture. However, the sustainability of this transformation remains contingent upon complementary policies that govern sectoral allocation, technological standards, and institutional quality.

This study's findings both confirm and crucially extend the existing body of knowledge on FDI and development by demonstrating that key relationships are contingent on a host economy's level of advancement, as proxied by its position in the GFDI distribution. The findings provide nuanced empirical validation for foundational models of structural change. The significantly negative effect of GFDI on agriculture at upper quantiles strongly supports the theories of Lewis (1954) and Chenery (1960), empirically demonstrating that in high-GFDI Southeast Asian economies, capital inflows accelerate the reallocation of resources away from primary sectors—a trend consistent with broader regional patterns (Athukorala, 2014; Ertimi et al., 2025).

The study highlights critical sectoral specificities often obscured in aggregate analyses. The weak linkage between GFDI and mining contrasts with evidence from resource-dependent regions like Africa, instead aligning with analyses that position manufacturing and services FDI as the central drivers of structural change in ASEAN. Simultaneously, the non-linear, cyclical pattern observed in real estate aligns with policy concerns regarding FDI-fueled asset price volatility in emerging markets, as noted in specific national contexts like Vietnam (Pham, 2019).

Collectively, by applying a quantile framework, this research moves beyond confirming average relationships to elucidating how the impact of GFDI on structural transformation evolves across stages of investment-driven development, thereby providing a more

http://www.doi.org/10.62341/istj-vol38-2-ba44

dynamic and contingent understanding of this critical process. While GFDI contributes to economic upgrading, its environmental implications depend on complementary policies in technology, energy, and governance.

6. Conclusion and Policy Implications

Based on our quantile-specific findings, we propose three stylized policy recommendations:

1. For low-GFDI economies (e.g., Myanmar, Cambodia during early years):

Prioritize GFDI that directly builds physical and commercial infrastructure (construction, transport, logistics). These investments create immediate employment, attract complementary domestic capital, and lay the foundation for broader industrialization.

2. For medium-GFDI economies (e.g., Vietnam, Philippines, Indonesia):

Shift focus toward manufacturing and business services that offer stronger technology spillovers and backward linkages. Invest in absorptive capacity (education, skills, supplier development) to maximize knowledge transfer from GFDI.

3. For high-GFDI economies (e.g., Singapore, Malaysia, Thailand):

Use GFDI to upgrade into high-value-added activities (R&D, digital services, green technologies) while actively managing the social transition from agriculture through retraining and social safety nets. Avoid over-reliance on mining (enclave effect) and speculative real estate, which may generate asset bubbles without sustainable structural change.

From a sustainability standpoint, the findings suggest that Greenfield FDI can support sustainable development indirectly by accelerating structural transformation toward more productive and diversified economic structures. However, this contribution is not automatic. Without complementary public policies—particularly those related to technological regulation, energy systems, and institutional governance—structural upgrading may not translate into environmentally sustainable outcomes. Consequently,

http://www.doi.org/10.62341/istj-vol38-2-ba44

Greenfield FDI should be viewed as a potentially enabling force for sustainability, whose ultimate impact depends on how it is strategically embedded within a broader development framework.

This study investigated the heterogeneous relationship between Foreign Direct Investment in New Projects (FDI) and structural transformation in eight Southeast Asian economies from 2003 to 2018. Using Quantile Regression by the Method of Moments (MM-QR), the analysis overcomes the limitations of conditional mean estimators to reveal how the sectoral impact of FDI varies significantly across the conditional distribution of investment.

The main conclusion is that FDI is a potent, yet complex driver of structural change, with its effects dependent on both the recipient sector and the level of FDI penetration in the host economy. The results outline a clear and dynamic transformation trajectory: at lower investment levels, GFDI simultaneously accelerating the relative decline of agriculture. Furthermore, GFDI in resource extraction sectors is not an important factor for structural change for low levels of GFDI but might help in capital deepening for an already heavily invested economy. This is consistent with the "enclave" typification of resource extraction FDI, which retains weak linkages with the rest of the economy.

This study highlights that the impact of Greenfield FDI (GFDI) on structural transformation is heterogeneous and depends on the level of investment. Policy responses should therefore be tailored to each stage: low-GFDI economies should prioritize infrastructure and construction to stimulate initial growth. Middle-stage economies should focus on strengthening linkages, technology transfer, and human capital development. High-GFDI economies need to manage structural shifts by supporting labor reallocation and upgrading into high value-added sectors. The findings caution against over-reliance on mining, as its enclave nature limits spillovers and broader economic integration. Similarly, excessive investment in real estate may lead to speculative distortions rather than sustainable structural change. Finally, while GFDI may indirectly support development,

http://www.doi.org/10.62341/istj-vol38-2-ba44

its environmental sustainability effects are conditional and not directly established in this study.

These findings have significant policy implications. A uniform strategy for attracting FDI is likely insufficient. For economies in the lower quantiles of gross FDI, policies should prioritize investments that build physical and commercial infrastructure. Economies with high gross FDI should leverage investment to modernize in high value-added activities and manage the social transition associated with a declining agricultural sector. Furthermore, the minimal impact on mining and the non-linear effect on the real estate sector warn against over-reliance on extractive or speculative FDI for sustainable transformation. In conclusion, this research asserts that gross FDI is a critical channel for structural transformation in Southeast Asia, but its effectiveness is not automatic. The transformative outcome critically depends on a country's position on the investment trajectory and its ability to channel FDI into sectors that align with each stage of its development path

7. Declaration of Competing Interest

The authors assert that no competing financial interests or personal relationships that may potentially have biased the research are presented in this paper.

References

Amendolagine, V., Rabellotti, R., & Ribaudo, D.(2017). Green FDI and Knowledge Spillovers in Host Economies. *Available at SSRN 5123938*.

Arnold, J. et al. (2016), “Services Reform and Manufacturing Performance: Evidence from India”, Economic Journal, Vol. 126/590.

Assamah, D., & Yuan, S. (2024). Greenfield investment and job creation in Ghana: a sectorial analysis and geopolitical implications of Chinese investments. *Humanities and Social Sciences Communications*, *11*(1), 1-11.

http://www.doi.org/10.62341/istj-vol38-2-ba44

Bala, H., Abubakar, A. H., Al Absy, M. S. M., Yusuf, J., Khatoon, G., Sani, A. U. A., ... & Zahid, U. (2025). The effect of foreign direct investment on the nexus between green levies and green energy technologies. *International Journal of Energy Economics and Policy*, *15*(1), 267-273.

Bashir, M. F., M. Bashir, and L. Shahzad. 2024. "Natural Resource Abundance, Digitalization and Institutional Governance: The Critical Challenges Towards Net-Zero Transformation." Resources Policy 99: 105412.

Braunstein, Elissa. 2006. *Foreign direct investment, development and gender equity: A review of research and policy.* United Nations Research Institute for Social Development, occasional paper.

Ertimi, B., Sarmidi, T., Khalid, N., & Ali, M. H. (2025). Revisiting The Role of The Oil Curse And Its Transmission Channels In Shaping Petrostates'growth: An Evidence From A Quantile Regression. *The Singapore Economic Review*, *70*(06), 1677-1711.

Farole, T., and D. Winkler. 2014. Does FDI Work for Africa? Assessing Local Spillovers in a World of Global Value Chains. Economic Premise 135: 1–6.

Fons-Rosen, C., Kalemli-Ozcan, S., Sorensen, B. E., Villegas-Sanchez, C., and Volosovych, V. (2021). "Quantifying productivity gains from foreign investment." *Journal of International Economics*, 131:103456.

Fu, X., Buckley, P. J., & Fu, X. M. (2020). The growth impact of Chinese direct investment on host developing countries. *International Business Review, 29*, 101658.

Fuglie, K., Jelliffe, J., & Morgan, S. (2021). Slowing productivity reduces growth in global agricultural output. *Amber waves: The economics of food, farming, natural resources, and rural America*, *2021*.

Hale, G. and Long, C. (2011). Did Foreign Direct Investment Put an Upward Pressure on Wages in China? IMF Economic Review, 59(3), pp.404–430.

Structural Transformation as a Driver of Sustainability: The Conditional Impact of Greenfield FDI in Southeast Asia

http://www.doi.org/10.62341/istj-vol38-2-ba44

Hasudungan, A., Raeskesya, D.G.S. & Fromm, I. (2024). Analysis of the foreign direct investment, oil palm expansion, and food security in Indonesia. Discover Sustainability 5, 287.

Hijzen, A., Jean, S. & Mayer., T. (2011). The effects at home of initiating production abroad: evidence from matched French firms. Review of World Economics, 147, 457–483.

Hoekman, B., P.C. Mavroidis, and D. Nelson (2023) Noneconomic Objectives, Globalization and Multilateral Trade Cooperation. London: CEPR Press.

Hoekman, B., Sanfilippo, M., & Tambussi, M. (2025). Foreign direct investment and structural transformation in Africa. *The World Bank Economic Review*, lhaf009.

Wrana, J. (2024). FDI and human capital development: A tale of two Southeast Asian economies. *Journal of International Business Policy*, *7*(3), 314-336.

Jing, H., & Zhan, W. (2024). Outward Foreign Direct Investment and Supply Chain Concentration: Evidence from China. *Sustainability*, *16*(16), 6746.

Le, H. T. P., Pham, H., Do, N. T. T., & Duong, K. D. (2024). Foreign direct investment, total factor productivity, and economic growth: evidence in middle-income countries. *Humanities and Social Sciences Communications*, *11*(1), 1-11.

Machado, A. F., & Silva, J. M. C. (2019). Quantiles via moments. *Journal of Econometrics, 213*, 145–173.

McArthur, J. W., & McCord, G. C. (2017). Fertilizing growth: Agricultural inputs and their effects in economic development. *Journal of Development Economics, 127*, 133–152.

Mühlen, H., & Escobar, O. (2020). The role of FDI in structural change: Evidence from Mexico. World Economy, 43(3), 557–585.

Narula, R., & van der Straaten, K. (2020). A comment on the multifaceted relationship between multinational enterprises and within-country inequality. Critical Perspectives on International Business, 17(1), 33–52.

Neffke, F., M. Hartog, R. Boschma, and M. Henning. 2018. "Agents of Structural Change: The Role of Firms and Entrepreneurs in

http://www.doi.org/10.62341/istj-vol38-2-ba44

Regional Diversification." *Economic Geography* 94 (1): 23–48.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P., Yang, L., 2020. Transformations to sustainability: Combining structural, systemic and enabling approaches.

Whitfield, L., Staritz, C., & Morris, M. (2020). Global value chains, industrial policy and economic upgrading in Ethiopia's apparel sector. *Development and Change*, **51**(4), 1018–1043.

Zhytomyrska, T., & Chymshyr, H. (2025). PhD in Economical Sciences, Department of Management in the Transport Industry, Danube Institute of National University" Odessa Maritime Academy" ORCID ID: http://orcid. org/0000-0002-7352-0678 N. Bykovets, PhD in Technical Sciences, Associate Professor. *ІНВЕСТИЦІЇ*, 202520.